

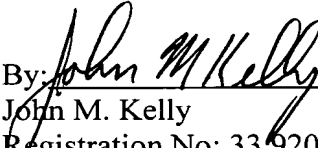
Page 4

REMARKS

Applicants respectfully request entry of the attached Substitute Specification and amendments to the claims. The claims are amended for clarity. Applicants have attached clean pages of the claims. On full faith and belief, the undersigned attests that no new matter has been added to the Substitute Specification. If there are any questions or matters to be discussed, the Examiner is invited to contact the undersigned.

Any fees required to complete the filing of this response, may be charged to Deposit Account No. 50-0911. Please credit any overpayment to deposit Account No. 50-0911.

Respectfully submitted,
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Method of forming a Seal Pattern for Liquid Crystal Display Device

Cross Reference

This application claims the benefit of Korean Patent Application No.1999-0036786, filed on September 1, 1999, under 35 ~~{U.S.C. § 119}~~ [U.S.C.§119], the
5 entirety of which is hereby incorporated by reference.

Background of the invention

Field of the invention

The present invention relates to a [seal pattern used in a] liquid crystal
10 display (LCD) device~~{, and more particularly, to a seal pattern and the same method in manufacturing the liquid crystal display device.}~~[..]

Description of Related Art

A typical LCD device comprises a LCD panel having upper and lower
15 substrates [that are] spaced apart from and ~~{opposite}~~ [opposed] to each other ~~{with a[, and an interposed]}~~ liquid crystal layer ~~{interposed therebetween}~~. The upper substrate includes [a] common ~~{electrodes}~~ [electrode], and the lower substrate includes switching elements[,] such as thin film transistors (TFTs)[,] and pixel electrodes.

20 ~~{In}~~ [As] a brief explanation about the manufacturing process of a liquid crystal cell ~~{comprised in the}~~ [of a] liquid crystal panel, the common ~~{electrodes}~~ [electrode] and the pixel electrodes are respectively formed over the upper and lower substrates~~{, a}~~[. A] seal pattern is formed over the lower substrate, [and then] the upper and lower substrates are aligned [and] spaced apart from each other so that the common
25 ~~{electrodes}~~ [electrode] of the upper substrate and the pixel electrodes of the lower substrate are ~~{opposite to each other, the}~~ [opposed. A] liquid crystal is [then] injected into the gap ~~{therebetween}~~ [between the upper and lower substrates] through an

injection hole~~{, the}~~. **The** injection hole is **[then]** sealed, and finally, polarizing films are ~~{respectively}~~ attached to ~~{each}~~ **[the]** outer ~~{surface}~~ **[surfaces]** of the upper and lower substrates.

~~{The}~~ **[In operation, the]** amount of light passing through ~~{the}~~ **[a]** liquid
5 crystal cell is controlled by **[an]** electric field formed by the pixel and common electrodes~~{, and}~~ **[such that]** characters or images are ~~{displayed}~~ **[produced]** due to ~~{the}~~ **[a]** light shutter effect.

~~{Compared with the thin film transistor or color filter manufacturing process,~~
~~the}~~ **[The]** liquid crystal cell manufacturing process ~~{barely}~~ has **[few]** repeated steps.
10 The ~~{total}~~ **[overall]** process is ~~{approximately}~~ divided into an orientation film forming process, a cell gap forming process, and a cell cutting process ~~{for}~~ **[that produces cells of]** a desired size.

Referring **[now]** to FIG. 1, ~~{the}~~ **[a]** typical liquid crystal cell manufacturing process ~~{is}~~ **[will be]** explained in detail.

15 As shown in FIG. 1, the first step is to form an array of ~~{the}~~ thin film transistors and ~~{the}~~ corresponding pixel electrodes ~~{over}~~ **[on]** the lower substrate.

The second step is to form ~~{the}~~ **[an]** orientation film over the lower substrate by uniformly depositing a polymer thin film ~~{over}~~ **[on]** the lower substrate[,] and **[then]** uniformly rubbing the polymer thin film with a fabric.

20 The rubbing process ~~{means to rub}~~ **[is performed by rubbing]** the surface of the polymer thin film in a proper direction with the fabric so as to ~~{decide}~~ **[establish]** the orientation direction of the liquid crystal. A typical orientation film uses an organic thin film[,] such as a polyimide thin film.

The third step is to print the seal pattern over **[the]** upper substrate.

Due to the seal pattern, after attaching the upper and lower substrates, a ~~{spacing}~~ [space] for interposing the liquid crystal is formed~~{, and}~~[. The seal pattern also ensures that] the interposed liquid crystal doesn't leak out of the liquid crystal cell. A thermosetting plastic and a screen-print technology are conventionally used for the
5 seal pattern.

The fourth step is to scatter spacers over the lower substrate.

The spacers have a definite size ~~{in order to}~~ [and] maintain a precise and uniform spacing between the upper and lower substrates. Accordingly, the spacers are scattered throughout the lower substrate ~~{with}~~ [at] a uniform density via [either] a wet
10 spray method of spraying ~~{the}~~ spacers mixed with an alcohol[,] or a dry spray method of spraying only the spacers.

Further, the dry spray method is divided into a static electric spray method ~~{using}~~ [that uses] static electricity[,] and a non-electric spray method ~~{using a}~~ [that uses gas] pressure ~~{of gas, and since the}~~[. Since] static electricity it ~~{harmful}~~
15 [detrimental] to the liquid crystal, the non-electric spray method is widely used.

After ~~{the process of}~~ scattering spacers, in the fifth step, the upper substrate having ~~{the}~~ color filters and the lower substrate having the thin film transistor array are aligned and attached ~~{with}~~ [to] each other.

An aligning margin, which is less than a few micrometers, ~~{does}~~ [has] an
20 important role in the aligning and assembling process. If the two substrates are aligned and attached beyond the aligning margin, light leaks away ~~{so}~~ [such] that the liquid crystal cell doesn't ~~{make}~~ [have] a desired display quality.

In the sixth step, the liquid crystal cell fabricated through ~~{the step 1 to 5 for interposing the liquid crystal}~~ [steps 1 to 5]is cut into unit ~~{cell}~~ [cells.]

Conventionally ~~{in the early stage}~~, the liquid crystal is injected into the spacing between the upper and lower substrates ~~{and}~~ **[, and then the liquid crystal cell is]** cut into a plurality of unit cells. But ~~{, as the larger display area becomes applied, the spacing for}~~ **[for larger displays,]** the liquid crystal **[cell]** is cut into ~~{the}~~ unit ~~{cell}~~
5 **[cells]** before the liquid crystal is interposed ~~{, and}~~ **[. After cutting,]** the liquid crystal **[then]** is ~~{respectively}~~ injected into the ~~{unit cell so as to form a plurality of the}~~ **[individual]** unit cells.

The process of cutting comprises a scribing process of ~~{forming cutting}~~ **[marking]** lines on the substrate ~~{with}~~ **[using]** a diamond pen **[, which is]** harder than
10 the **[glass]** substrate ~~{made of glass}~~, and **[then]** a breaking process of cutting the substrate ~~{by force (or)}~~ **[using force (or) pressure]** ~~{according to}~~ **[along]** the ~~{cutting}~~ **[marked]** lines.

The seventh step is ~~{to inject}~~ **[injecting]** the liquid crystal into the unit cell.

Since ~~{the}~~ **[a]** unit cell has a few square ~~{centimeters in}~~ **[centimeter surface]** area and **[only]** a few ~~{micrometers in}~~ **[micrometer]** gap ~~{size}~~, a vacuum
15 injection ~~{technology using the difference in pressure}~~ **[process of injecting the liquid crystal that uses a pressure difference]** is effectively and widely used ~~{for}~~.

Now, referring to Fig. 2, ~~{the}~~ **[a]** screen-print method ~~{applied}~~ for **[applying]** the seal pattern ~~{process of}~~ **[according to]** the third step is explained **[in**
20 **more detail]**.

The screen-print method is facilitated ~~{with}~~ **[using]** a patterned screen 6 and a squeegee 8.

~~{In order to}~~ **[To]** interpose the liquid crystal without leakage, the seal pattern 2 is formed along ~~{and on}~~ the ~~{edge of a}~~ substrate 1 ~~{, at one side of the edge,}~~ **[near**

the edges, and] an injection hole 4 for injecting the liquid crystal is formed.

To form the seal pattern 2, a thermosetting plastic ~~{including the}~~ **[having embedded]** spacers ~~{for maintaining}~~ **[to maintain]** the gap between the two substrates is distributed on the substrate 1 ~~{, and thereafter}~~**[. Thereafter,]** a solvent ~~{included}~~ in the sealant is evaporated ~~{for a leveling}~~**[, leaving a level surface].**

In forming the seal pattern, the uniformity in thickness and **[in]** width of the sealant is ~~{a}~~ very important ~~{factor}~~ to maintain ~~{the}~~ **[a]** uniform spacing (or gap) between the two substrates.

For the seal pattern 2, a thermosetting or an ultraviolet-setting epoxy resin ~~{and}~~ **[or]** the like ~~{are}~~ **[is]** conventionally employed. But, though the epoxy resin itself is not harmful to the liquid crystal, an amine in a thermohardening solvent decomposes the liquid crystal. Thus, when using ~~{the}~~ **[an]** epoxy resin for the seal pattern 2, the sealant formed through the screen-print method is pre-baked ~~{sufficiently with}~~ **[using]** a gradual change of ~~{a}~~ baking temperature.

Hereinafter, referring to Fig. 3, the seal pattern **[itself]** is explained in detail.

Conventionally, ~~{in order}~~ to supply an electric field for the liquid crystal, electrode pads are formed over the lower substrate ~~{having the thin film transistors; a}~~**[. A]** voltage is **[then]** supplied to the common ~~{electrodes}~~ **[electrode]** of the upper substrate by **[way of]** the electrode pads ~~{through certain}~~ **[using]** electric conductors formed on the lower substrate. ~~{At this point, for}~~ **[For]** the electric conductors, a silver paste ~~{(named)}~~**[(hereinafter referred to)]** as a silver dot ~~{(hereinafter) is applied}~~ **[10] is usually used].**

As shown in Fig. 3, the silver dot 10 is formed ~~{on the}~~ outside of the seal pattern ~~{2 in the opposite direction}~~ with respect to the display area A. Namely, the seal

pattern 2 is formed along and on the substrate, ~~{and, around}~~ **[but near]** the silver dot~~{,}~~ **[10, and]** the seal pattern ~~{bends in}~~ **[forms]** a rectangular shape ~~{in order}~~ to bypass ~~{and surround}~~ the silver dot 10. ~~{Since, around}~~ **[Around]** the silver dot 10, the seal pattern 2 ~~{is protruded toward the display area A to a length L in the rectangular shape, spots occurs on}~~ **[protrudes inward a length L. Light spots can occur in]** the display area A of the liquid crystal display device due to the amine included in the seal pattern 2.

Though the above-mentioned screen-print method is ~~{most}~~ widely used ~~{for the seal pattern due to the superiority in}~~ **[due its]** convenience, the screen-print method ~~{may result in an error by a}~~ **[can produce errors as a result of the]** contact between the screen and the orientation film formed over the substrate~~{, and is not effectively adopted to a larger substrate}~~**[. Additionally, the screen-print method is not easily adopted to larger substrates].**

Further, in the screen-print method, after the sealant is formed on the whole patterned screen, the squeegee rubs the sealant ~~{so as}~~ to form the seal pattern. Since the sealant is formed ~~{on}~~ throughout the patterned screen, ~~{an over waste}~~ **[part]** of the sealant ~~{occurs}~~ **[is wasted]**.

To overcome the above-mentioned ~~{problem of the screen print method}~~ **[problems]**, a dispenser-print method ~~{becomes}~~ **[has]** gradually **[been]** adopted.

Referring to Fig. 4, in the dispenser-print method, a dispenser 20 **[is]** filled with the sealant ~~{and a table 100 where the}~~**[. A]** substrate 1 is **[then]** located ~~{is used. On operation, the}~~ **[on a table. The]** dispenser 20 **[then]** moves over the table 100 ~~{, forms the sealant according to an arrow direction so as to form}~~ **[as the dispenser dispenses sealant in]** the sealant pattern 2.

However, ~~{since}~~ the ~~{above-mentioned}~~ dispenser-print method has ~~{a poor quality in complicate printing, the conventional many bent}~~ **[poor quality when dispensing along a complex pattern]**. Therefore, the seal pattern 2 shown in Fig. 3 is difficult to ~~{acquire through}~~ **[reliably produce using]** the dispenser-print method.

5

SUMMARY OF THE INVENTION

In view of the foregoing and other problems ~~{of the conventional seal pattern and the same methods}~~, it is an object of the present invention to provide ~~{a}~~ **[for]** small-~~{bent}~~ **[bend]** seal ~~{pattern in order to}~~ **[patterns that]** decrease **[light]** spots ~~{on}~~ **[in]** the display area of ~~{the}~~ liquid crystal display ~~{device}~~ **[devices]**.

Another object is to provide a ~~{less bent}~~ **[small-bend]** seal pattern ~~{in order that}~~ **[that is suitable for use with]** the dispenser-print technology ~~{is adapted to the seal pattern}~~.

Thus, to overcome the above-mentioned objects, the present invention provides~~{, in}~~ a method of forming a seal pattern ~~{of}~~ **[for]** a liquid crystal display panel having a liquid crystal layer ~~{comprising}~~ **[. That method comprises]** forming a common electrode on a first substrate~~{,}~~**[;]** forming a plurality of conductive contact dots on the second substrate~~{,}~~**[;]** forming a seal pattern along edges of the second substrate, ~~{said}~~ **[wherein the]** seal pattern ~~{having}~~ **[includes]** a plurality of triangular bent portions which ~~{is}~~ **[are]** bent toward ~~{an}~~ **[the]** inside of the second substrate~~{, and forming}~~**[; joining the substrates; and injecting]** the liquid crystal layer between first and second substrates.

The foregoing and other objectives of the present invention will become more apparent from the detailed description given hereinafter. However, it should be

understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications [that are] within the spirit and scope of the invention will become apparent to those skilled in the art ~~{from this detailed description}~~.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, in which like reference numerals denote like parts, and in which:

Fig. 1 is a block diagram illustrating a typical manufacturing process for a liquid crystal cell;

Fig. 2 is a perspective view illustrating a seal pattern process with a screen-print method;

Fig. 3 is a plan view illustrating ~~{the}~~ [a] seal pattern around a silver dot;

Fig. 4 is a perspective view illustrating a dispenser-print method for ~~{the}~~ [a] seal pattern;

Fig. 5 [is an expanded plan view of "r1" of Fig. 6;

Fig. 6] is a plan view illustrating ~~{the}~~ [a] seal pattern around ~~{the}~~ [a] silver dot according to a first embodiment of the present invention; {

~~Fig. 6 is an expanded plan view of "r1" of Fig. 5;}~~ and

Fig. 7 is a plan view illustrating ~~{the}~~ [a] seal pattern around the silver dot according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF ~~{PREFERRED}~~ [ILLUSTRATED]

EMBODIMENTS

Referring now to the drawings, and more particularly to Fig. ~~{5}~~ [6], a first
5 embodiment of the present invention ~~{is}~~ [will now be] described.

Fig. ~~{5}~~ [6] illustrates ~~{the feature}~~ [features] of a seal pattern 200 according to the first embodiment of the present invention.

As shown in Fig. ~~{5}~~ [6], around a silver dot 10, the seal pattern 200 has an open-sided triangular bent portion ~~{in order to bypass}~~ [that bypasses] and ~~{surround}~~
10 [surrounds] the silver dot 10 with a vertex [that is] opposite to the open-side. The vertex is protruded toward a display area "A". The triangular shape of the seal pattern 200 decreases the [area of the] protruding portion of the seal pattern in comparison with the rectangular ~~{bent}~~ [bend] of the conventional seal pattern.

Further, the triangular shape of the seal pattern 200 decreases the number of
15 ~~{bents}~~ [bends] so that ~~{a}~~ [the] dispenser-print method ~~{of relatively poor printing quality is sufficiently applied for printing}~~ [is better able to print] the seal pattern.

In the seal pattern 200 according to the first embodiment of the present invention, the triangular ~~{bent}~~ [bend] has a first vertex "r1", a second vertex "r2", and a third vertex "r3" ~~{of a}~~ [that are all] rounded ~~{shape, which}~~ [, as] will be explained
20 with ~~{Fig. 6. Unless, around}~~ [the assistance of Fig. 5. Otherwise, at] the vertexes in the seal pattern, cuttings or line-opens [can] occur during the dispenser printing.

More specifically, the distance "d" between the silver dot 10 and the third vertex "r3" ~~{protruded toward the display area "A"}~~ is preferably 0.1 to 1 millimeters(mm); the distance "l" ~~{between the first and the second vertexes "r1" and~~

"r2" is preferably 5 to 20 mm.

Fig. ~~{6}~~ [5] illustrates an expansion of the first vertex "r1" having a ~~{round of}~~ turning radius "R". The turning radius "R" of ~~{the round of the}~~ vertex "r1" is preferably 0.5 to 5 mm. The turning radius in the first vertex "r1" is also ~~{applied to}~~
 5 [that of] the second and third vertexes. Namely, the second and third vertexes also have the ~~{round}~~ [same roundness].

However, the seal pattern according to the first embodiment of the present invention is not limited to the structure of the above-described triangular ~~{bent}~~ [bend].

That is to say, referring to Fig. 7, as a modification of the first embodiment of
 10 the present invention, instead of the triangular bent portion, the seal pattern 200 has a circular or an elliptical bent portion ~~{surrounding}~~ [that surrounds] the silver dot 10 ~~{with}~~ [and that has] two rounded vertexes "r1" and "r2". The turning radius of the rounded vertexes "r1" and "r2" is also [beneficially] 0.5 to 5 mm like the vertexes of the triangular bent portion ~~{in Fig. 5}~~.

15 As described above with reference to Figs 5 to 7, the triangular, circular, or elliptical ~~{bent}~~ [bend] of the seal pattern 200 according to the preferred embodiment decreases the display-area-penetrating portion of the seal pattern so as to minimize ~~{the}~~ [light] spots on the display area around the silver dots.

Further, in comparison with the conventional rectangular bent portion, due to
 20 the decrease of the number and ~~{bent angle}~~ [angles] of bent points in the bent ~~{portion}~~ [portions] such as the vertexes, the dispenser-print method ~~{is applied for forming}~~ [can be used to apply] the seal pattern without ~~{declination in}~~ [denigration of] printing quality.

While the invention has been particularly shown and described with reference

to the preferred embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in form and details may be made therein without departing from the spirit and scope of the invention.

What is claimed is:

1. A method of forming a ~~{seal pattern of a}~~ liquid crystal display panel ~~{having a liquid crystal layer}~~ [,] comprising the steps of:

forming a common electrode ~~{over}~~ **[on]** a first substrate;

forming a plurality of conductive contact dots on a second substrate;

forming a seal pattern ~~{along edges of}~~ **[on]** the second substrate, ~~{said}~~ **[the]** seal pattern having a plurality of triangular bent portions ~~{, the triangular bent portions being bent}~~ **[that each have a vertex that is directed]** toward an inside of **[the second substrate, wherein each triangular bent portion circumvents a conductive contact dot;**

assembling the first substrate and] the second substrate; and

forming a liquid crystal layer between the first and second substrates.

2. The method according to claim 1, wherein the conductive contact dot comprises a silver (Ag).

3. The method according to claim 1, wherein the ~~{seal pattern of the}~~ **[triangular]** bent portions **[each]** include a first **[vertex]**, a second **[vertex]**, and a third ~~{vertexes}~~ **[vertex]**.

4. The method according to claim 3, wherein the ~~{seal pattern has a round with a radius in each of the vertexes.}~~ **[first vertex, the second vertex, and the third vertex all have a rounded shape that is defined by a radius.]**

5. The method according to claim 4, wherein the radius ~~{of the first, the second, and the third vertex}~~ is 0.5 to 2 millimeters.

6. The method according to claim 4, wherein a distance between ~~{the}~~ [a] first [vertex] and ~~{the}~~ [a] second ~~{vertexes}~~ [vertex] is 5 to 20 millimeters.

7. The method according to claim 4, wherein a distance between ~~{the}~~ [a] conductive contact dot and ~~{the}~~ [a] third vertex ~~{of the triangular bent portion}~~ is 0.1 to 5 millimeters.

8. The method according to claim 1, wherein the seal pattern ~~{forms}~~ [is formed] by a dispenser.

9. A method of forming a ~~{seal pattern of a}~~ liquid crystal display panel[,] comprising the steps of:

forming a common electrode on a first substrate;

forming a plurality of conductive contact dots on the second substrate;

forming a seal pattern ~~{along edges of}~~ [on] the second substrate, ~~{said}~~ [the] seal pattern having a plurality of semicircular bent portions, the semicircular bent portions being bent toward an inside of [the second substrate wherein each semicircular bent portion circumvents a conductive contact dot;

assembling the first substrate and] the second substrate; and

forming a liquid crystal layer between first and second substrates.

10. The method according to claim 9, wherein each of the two ends of the semicircular portion has a radius of 0.5 to 2 mm.

11. The method according to claim 9, wherein ~~{a distance between the two ends of}~~ the semicircular portion ~~{is 5 to 20}~~ **[has a radius of 2.5 to 10]** millimeters.

12. The method according to claim 9, wherein a distance between ~~{the}~~ **[a]** conductive contact dot and ~~{the}~~ **[a]** semicircular portion is 0.1 to 5 millimeters.



ABSTRACT OF THE DISCLOSURE

The present invention discloses a method of forming a seal pattern of a liquid crystal display panel having a liquid crystal layer comprising the steps of: forming common electrodes over a first substrate; forming a plurality of conductive contact dots on the second substrate; forming a seal pattern along edges of the second substrate, said seal pattern having a plurality of triangular bent portions, the bent portions being bent toward inside of the second substrate; and forming a liquid crystal layer between first and second substrates.

~~{{(related-art)}}~~
FIG. 1

~~(related-art)~~
FIG. 2

~~(related-art)~~

FIG. 3
~~(related-art)~~
FIG. 4

FIG. 5

FIG. 6

FIG. 7)

This redlined draft, generated by CompareRite (TM) - The Instant Redliner, shows the differences between -
original document : C:\DOCXCOMPARE\COMPAREORIGINAL.DOC
and revised document: C:\DOCXCOMPARE\COMPAREREVISED.DOC

5

CompareRite found 262 change(s) in the text

Deletions appear as Overstrike text surrounded by {}
Additions appear as Bold text surrounded by []

----- REVISION LIST -----

The bracketed numbers refer to the Page and Paragraph for the start of the paragraph in both the old and the new documents.

[1:3 1:3] Changed	"U.S.C. § 119" to "U.S.C.§119"
[1:6 1:6] Changed	"a liquid" to "a seal pattern used in a liquid"
[1:6 1:6] Changed	", and more ... display device." to ".."
[1:8 1:8] Changed	"substrates spaced" to "substrates that are spaced"
[1:8 1:8] Changed	"opposite " to "opposed "
[1:8 1:8] Changed	"with a " to ", and an interposed "
[1:8 1:8] Changed	"layer interposed therebetween." to "layer."
[1:8 1:8] Changed	"includes common electrodes" to "includes a ... electrode"
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[1:8 1:8] Changed	"(TFTs) and" to "(TFTs), and"
[1:9 1:9] Changed	"In " to "As "
[1:9 1:9] Changed	"comprised in the " to "of a "
[1:9 1:9] Changed	"common electrodes and" to "common electrode and"
[1:9 1:9] Changed	", a " to ". A "
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[1:9 1:10] Changed	"The " to "In operation, the "
[1:9 1:10] Changed	"through the liquid" to "through a liquid"
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[1:9 1:10] Changed	"electrodes, and characters" to "electrodes ... characters"
[1:9 1:10] Changed	"displayed " to "produced "
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[2:2 2:2] Changed	"Referring to" to "Referring now to"
[2:2 2:2] Changed	"the " to "a "
[2:2 2:2] Changed	"is " to "will be "
[2:3 2:3] Changed	"of the thin" to "of thin"
[2:3 2:3] Changed	"and the corresponding" to "and corresponding"
[2:3 2:3] Changed	"over " to "on "
[2:4 2:4] Changed	"form the orientation" to "form an orientation"

[2:4 2:4] Changed then"	"thin film ... substrate and " to "thin film ... substrate, and
[2:5 2:5] Changed	"means to rub " to "is performed by rubbing "
[2:5 2:5] Changed	"decide " to "establish "
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[2:6 2:6] Changed	"over upper" to "over the upper"
[2:7 2:7] Changed	"spacing " to "space "
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[2:9 2:9] Changed	"via a" to "via either a"
[2:9 2:9] Changed	"spraying the spacers" to "spraying spacers"
[2:9 2:9] Changed	"alcohol or" to "alcohol, or"
[3:1 3:1] Changed electricity, and"	"method using ... electricity and" to "method that ...
[3:1 3:1] Changed	"using a " to "that uses gas "
[3:1 3:1] Changed	"of gas, and since the " to ". Since "
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[3:3 3:3] Changed	"so " to "such "
[3:3 3:3] Changed	"make " to "have "
[3:4 3:4] Changed	"the step 1 ... liquid crystal " to "steps 1 to 5 "
[3:4 3:4] Changed	"cell. " to "cells. "
[3:4 3:4] Changed	"Conventionally ... early stage," to "Conventionally,"
[3:4 3:4] Changed	"substrates and cut" to "substrates, ... cell is cut"
[3:4 3:4] Changed	", as the larger ... spacing for " to "for larger displays, "
[3:4 3:4] Changed	"the liquid ... cell before" to "the liquid ... cells before"
[3:4 3:4] Changed	", and " to ". After cutting, "
[3:4 3:4] Changed	"crystal is respectively" to "crystal then is "
[3:4 3:4] Changed	"unit cell ... plurality of the " to "individual "
[3:5 3:5] Changed	"forming cutting " to "marking "
[3:5 3:5] Changed	"with " to "using "
[3:5 3:5] Changed and"	"pen harder ... substrate made" to "pen, which ... substrate,
[3:5 3:5] Changed	"substrate ... glass, and a" to "substrate, and then a"
[3:5 3:5] Changed	"by force(or " to "using force (or "
[3:5 3:5] Changed	"according to " to "along "
[3:5 3:5] Changed	"the cutting lines." to "the marked lines."
[4:1 3:6] Changed	"to inject " to "injecting "
[4:2 4:1] Changed	"Since the unit" to "Since a unit"
[4:2 4:1] Changed	"centimeters in " to "centimeter surface "
[4:2 4:1] Changed	"and a" to "and only a"
[4:2 4:1] Changed	"micrometers in " to "micrometer "
[4:2 4:1] Changed	"gap size," to "gap,"
[4:2 4:1] Changed	"technology ... pressure " to "process of ... difference "

[4:2 4:1] Changed	"used for." to "used."
[4:3 4:2] Changed	"2, the screen-print ... applied for " to "2, a screen-print ...
for applying"	
[4:3 4:2] Changed	"process of " to "according to "
[4:3 4:2] Changed	"explained." to "explained in more detail."
[4:4 4:3] Changed	"with " to "using "
[4:5 4:4] Changed	"In order to " to "To "
[4:5 4:4] Changed	"along and ... edge of a" to "along the "
[4:5 4:4] Changed	"; at one side of the edge, " to "near the edges, and "
[4:6 4:5] Changed	"including the " to "having embedded "
[4:6 4:5] Changed	"for maintaining " to "to maintain "
[4:6 4:5] Changed	", and thereafter ... included in" to ". Thereafter, a solvent
in"	
[4:6 4:5] Changed	"for a leveling" to ", leaving a level surface"
[4:7 4:6] Changed	"and width" to "and in width"
[4:7 4:6] Changed	"is a very ... the uniform" to "is very important ... a
uniform"	
[4:8 4:7] Changed	"and " to "or "
[4:8 4:7] Changed	"are " to "is "
[4:8 4:7] Changed	"using the epoxy" to "using an epoxy"
[4:8 4:7] Changed	"sufficiently with " to "using "
[4:8 4:7] Changed	"of a baking" to "of baking"
[5:1 4:8] Changed	"pattern is" to "pattern itself is"
[5:2 4:9] Changed	"Conventionally, in order to" to "Conventionally, to"
[5:2 4:9] Changed	"having the ... transistors; a " to ". A "
[5:2 4:9] Changed	"is supplied" to "is then supplied"
[5:2 4:9] Changed	"electrodes " to "electrode "
[5:2 4:9] Changed	"by the" to "by way of the"
[5:2 4:9] Changed	"through certain " to "using "
[5:2 4:9] Changed	"At this point, for " to "For "
[5:2 4:9] Changed	"(named " to "(hereinafter referred to "
[5:2 4:9] Changed	"hereinafter) is applied" to "10) is usually used"
[5:3 5:1] Changed	"formed on the outside" to "formed outside"
[5:3 5:1] Changed	"pattern 2 ... direction with" to "pattern with"
[5:3 5:1] Changed	"and, around " to "but near "
[5:3 5:1] Changed	"dot, the" to "dot 10, and the"
[5:3 5:1] Changed	"bends in " to "forms "
[5:3 5:1] Changed	"shape in order ... surround the" to "shape to bypass the"
[5:3 5:1] Changed	"Since, around " to "Around "
[5:3 5:1] Changed	"is protruded ... occurs on " to "protrudes ... occur in "
[5:4 5:2] Changed	"is most widely" to "is widely"
[5:4 5:2] Changed	"for the seal ... superiority in " to "due its "
[5:4 5:2] Changed	"may result ... error by a " to "can produce ... result of the "
[5:4 5:2] Changed	", and is not ... substrate" to ". Additionally, ... substrates"
[5:5 5:3] Changed	"sealant so as to" to "sealant to"
[5:5 5:3] Changed	"formed on throughout" to "formed throughout"
[5:5 5:3] Changed	"an over-waste " to "part "
[5:5 5:3] Changed	"occurs" to "is wasted"

[5:6 5:4] Changed	"problem of the screen-print method" to "problems"
[5:6 5:4] Changed	"becomes " to "has "
[5:6 5:4] Changed	"gradually adopted." to "gradually been adopted."
[5:7 5:5] Changed	"20 filled" to "20 is filled"
[5:7 5:5] Changed	"and a table 100 where the " to ". A "
[5:7 5:5] Changed	"is located ... operation, the" to "is then located on a table."
The"	
[5:7 5:5] Changed	"20 moves" to "20 then moves"
[5:7 5:5] Changed	"; forms the ... as to form " to "as the dispenser ... sealant in
"	
[6:1 5:6] Changed	"However, since the above-mentioned" to "However, the "
[6:1 5:6] Changed	"a poor quality ... many-bent " to "poor quality ...
Therefore, the "	
[6:1 5:6] Changed	"acquire through " to "reliably produce using "
[6:3 6:2] Changed	"problems of ... same methods," to "problems,"
[6:3 6:2] Changed	"provide a small-bent" to "provide for small-bend"
[6:3 6:2] Changed	"bent " to "bend "
[6:3 6:2] Changed	"pattern in order to " to "patterns that "
[6:3 6:2] Changed	"decrease spots on" to "decrease light spots in"
[6:3 6:2] Changed	"of the liquid" to "of liquid"
[6:3 6:2] Changed	"device" to "devices"
[6:4 6:3] Changed	"less-bent " to "small-bend "
[6:4 6:3] Changed	"in order that " to "that is suitable for use with "
[6:4 6:3] Changed	"technology ... seal pattern." to "technology."
[6:5 6:4] Changed	"provides, in a" to "provides a"
[6:5 6:4] Changed	"pattern of a" to "pattern for a"
[6:5 6:4] Changed	"comprising " to ". That method comprises "
[6:5 6:4] Changed	"first substrate, forming a" to "first substrate; forming a"
[6:5 6:4] Changed	"second substrate, forming a" to "second substrate; forming
a"	
[6:5 6:4] Changed	"said " to "wherein the "
[6:5 6:4] Changed	"pattern having a" to "pattern includes a"
[6:5 6:4] Changed	"is " to "are "
[6:5 6:4] Changed	"an " to "the "
[6:5 6:4] Changed	", and forming " to "; joining ... injecting "
[6:6 6:5] Changed	"modifications within" to "modifications that are within"
[6:6 6:5] Changed	"art from this ... description." to "art."
[7:5 7:3] Changed	"the " to "a "
[7:6 7:4] Changed	"the " to "a "
[7:7 7:5] Changed	"5 is" to "5 is an expanded ... of Fig. 6; "
[7:7 7:6] Changed	"5 is" to "Fig. 6 is"
[7:7 7:6] Changed	"illustrating the seal" to "illustrating a seal"
[7:7 7:6] Changed	"around the silver" to "around a silver"
[7:7 7:5] Changed	"invention;" to "invention; "
[7:8 7:6] Changed	"Fig. 6 is ... Fig. 5; and" to "and"
[7:9 7:7] Changed	"illustrating the seal" to "illustrating a seal"
[7:10 7:8] Changed	"PREFERRED " to "ILLUSTRATED "
[7:11 7:9] Changed	"5" to "6"

[7:11 7:9] Changed	"is " to "will now be "
[8:1 7:10] Changed	"5 " to "6 "
[8:1 7:10] Changed	"the feature " to "features "
[8:2 7:11] Changed	"5" to "6"
[8:2 7:11] Changed	"in order to bypass " to "that bypasses "
[8:2 7:11] Changed	"surround " to "surrounds "
[8:2 7:11] Changed	"vertex opposite" to "vertex that is opposite"
[8:2 7:11] Changed	"the protruding" to "the area of the protruding"
[8:2 7:11] Changed	"rectangular bent of" to "rectangular bend of"
[8:3 8:1] Changed	"bents " to "bends "
[8:3 8:1] Changed	"a " to "the "
[8:3 8:1] Changed	"of relatively ... printing " to "is better able to print "
[8:4 8:2] Changed	"bent " to "bend "
[8:4 8:2] Changed	"of a " to "that are all "
[8:4 8:2] Changed	"shape, which " to ", as "
[8:4 8:2] Changed	"Fig. 6. Unless, around " to "the assistance ... Otherwise, at "
[8:4 8:2] Changed	"line-opens occur" to "line-opens can occur"
[8:5 8:3] Changed	"“r3” protruded ... area “A” is" to "“r3” is"
[8:5 8:3] Changed	"“”between" to "“” between"
[8:6 8:4] Changed	"6 " to "5 "
[8:6 8:4] Changed	"a round of turning" to "a turning"
[8:6 8:4] Changed	"of the round of the vertex" to "of vertex"
[8:6 8:4] Changed	"applied to " to "that of "
[8:6 8:4] Changed	"the round." to "the same roundness."
[8:7 8:5] Changed	"bent" to "bend"
[9:1 8:6] Changed	"surrounding " to "that surrounds "
[9:1 8:6] Changed	"with " to "and that has "
[9:1 8:6] Changed	"also 0.5" to "also beneficially 0.5"
[9:1 8:6] Changed	"portion in Fig. 5." to "portion."
[9:2 9:1] Changed	"bent " to "bend "
[9:2 9:1] Changed	"minimize the spots" to "minimize light spots"
[9:3 9:2] Changed	"bent angle " to "angles "
[9:3 9:2] Changed	"portion " to "portions "
[9:3 9:2] Changed	"is applied for forming " to "can be used to apply "
[9:3 9:2] Changed	"declination in " to "denigration of "
[11:2 10:2] Changed	"a seal pattern of a liquid" to "a liquid"
[11:2 10:2] Changed	"having a liquid crystal layer " to ", "
[11:3 10:3] Changed	"over " to "on "
[11:5 10:5] Changed	"along edges of " to "on "
[11:5 10:5] Changed	"said " to "the "
[11:5 10:5] Changed	", the triangular ... being bent " to "that each ... directed "
[11:5 10:5] Changed	"inside of the second" to "inside of ... contact dot;"
[11:5 10:6] Changed	"inside of the second" to "assembling ... the second"
[11:8 10:9] Changed	"seal pattern of the " to "triangular "
[11:8 10:9] Changed	"portions include" to "portions each include"
[11:8 10:9] Changed	"first," to "first vertex,"
[11:8 10:9] Changed	"second," to "second vertex,"
[11:8 10:9] Changed	"vertexes" to "vertex"

[11:9 10:10] Changed	"seal pattern ... vertexes." to "first vertex, ... a radius."
[11:10 10:11] Changed	"radius of ... vertex is" to "radius is"
[11:11 11:1] Changed	"between the first " to "between a first vertex"
[11:11 11:1] Changed	"and the second vertexes" to "and a second vertex"
[12:1 11:2] Changed	"between the conductive" to "between a conductive"
[12:1 11:2] Changed	"and the third ... portion is" to "and a third vertex is"
[12:2 11:3] Changed	"forms " to "is formed "
[12:3 11:4] Changed	"a seal pattern of a liquid" to "a liquid"
[12:3 11:4] Changed	"panel comprising" to "panel, comprising"
[12:6 11:7] Changed	"along edges of " to "on "
[12:6 11:7] Changed	"said " to "the "
[12:6 11:7] Changed	"inside of the second" to "inside of ... contact dot; "
[12:6 11:8] Changed	"inside of the second" to "assembling ... the second"
[12:9 12:1] Changed	"wherein a ... ends of the" to "wherein the"
[12:9 12:1] Changed	"is 5 to 20 " to "has a radius of 2.5 to 10 "
[12:10 12:2] Changed	"between the conductive" to "between a conductive"
[12:10 12:2] Changed	"and the semicircular" to "and a semicircular"
[16:1 13:2] Del Paras	"(related art) ... FIG. 7"